

Impact of Drinking Water Quality on Child health: Evidence from Rural Ethiopia

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Introduction

- Today, more than 700 million people most living in developing countries are without access to improved and adequate water (WHO/UNICEF 2014).
- Every year, more than 1.5 million children –under the age of five, die of diarrheal diseases (WHO/UNICEF, 2009) and unsafe drinking water is one of the major causes of diarrheal diseases.
- Increasing the provision of improved drinking water plays an important role in the fight against diarrheal diseases for young children in developing countries.

Objectives

- As a result of limited availability of safe drinking water, most rural Ethiopian household relies on unimproved water sources, such as rivers, ponds, streams, unprotected springs and wells which are easily polluted by human and animal feces. Therefore, it is important
- To assess the microbial quality of stored household drinking water, and
 - To examine the impact of contaminated drinking water on child health outcomes.

Study Areas

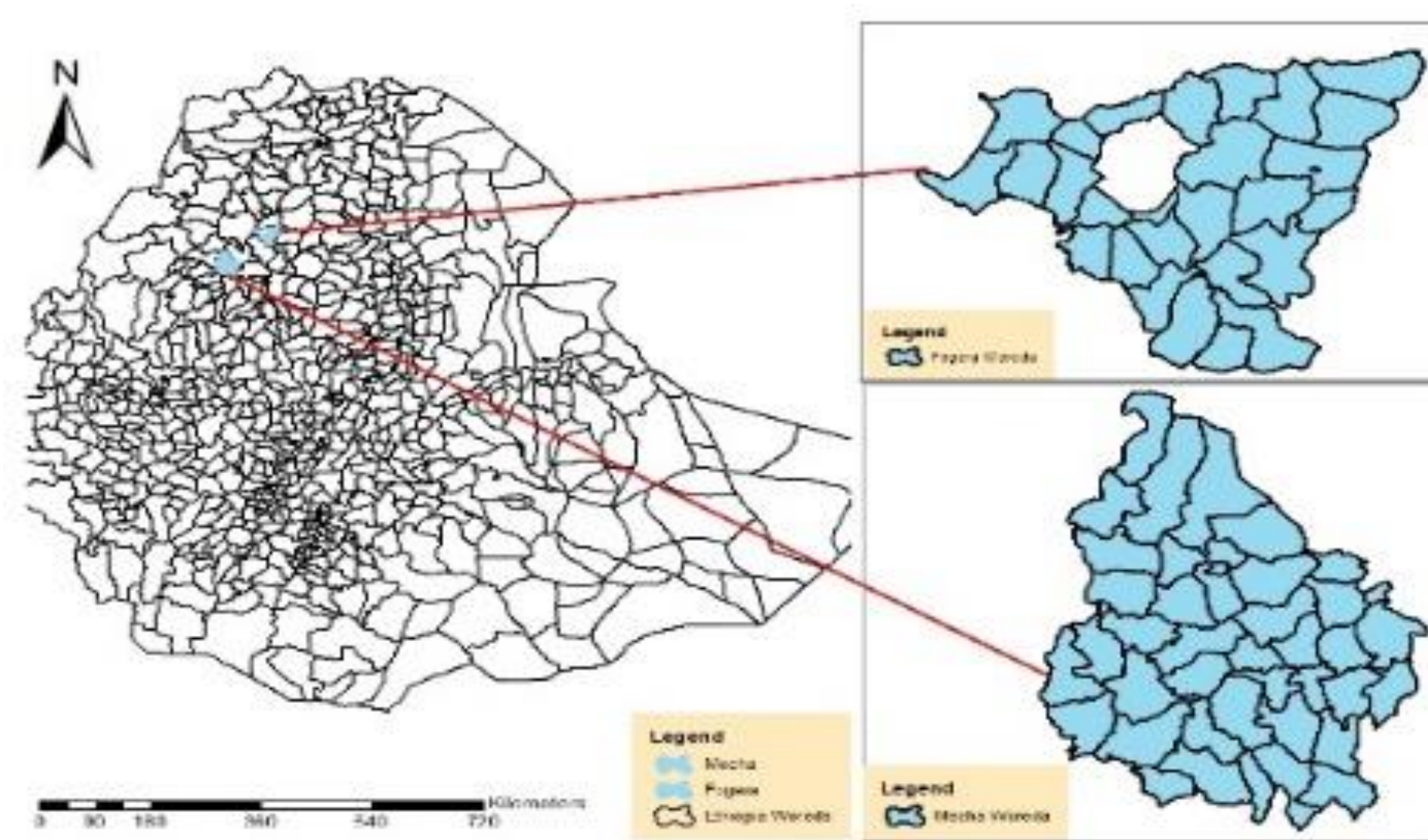


Figure 1. Map of the Study Areas

Data and Methods

A household survey has been conducted from February to June 2014 for 454 households. In addition;

- Water samples from household drinking water storage has been collected and tested for the presence of *Escherichia coli* (*E.coli*) bacteria (colony forming units per 100 ml) using membrane filtration method.

Child diarrhea: a self-reported prevalence of diarrheal symptoms by the Primary caretaker of the child in the last 14 days before the survey.

- Three or more bowl moments within 24 hours
- Water or very soft stool or presence of blood/mucus in the stool

Results and Discussions

- Based on the JMP definition, 50% of our sample households have access to improved drinking water source.
- 58% of the water samples from household's drinking water storage is contaminated with *E.coli* (at least one *E.coli* counts of CFU per 100 ml).
- The prevalence of diarrhea diseases for under 5 years of children in the last 14 days is 16%.

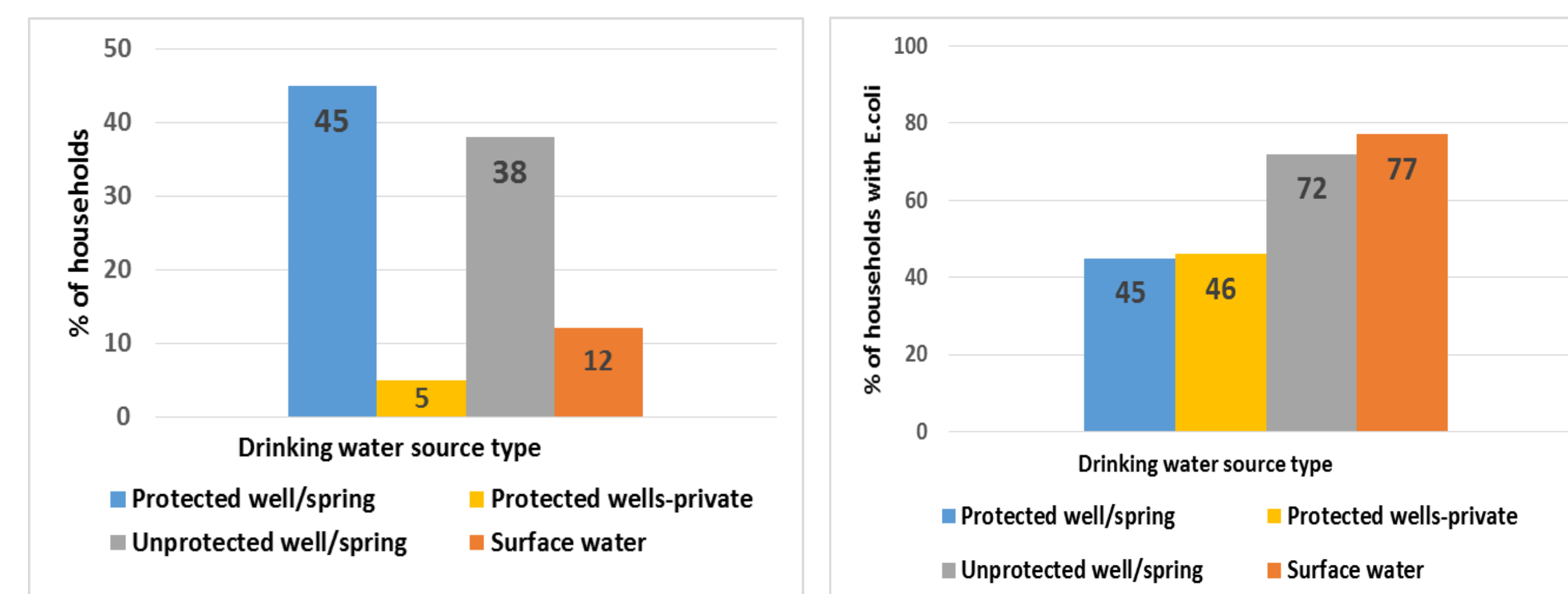


Figure 2: Types of Household's drinking water source and *E.coli* contamination by drinking water source type.

Empirical Strategy

$$D_{ij} = X_{ij}\beta_1 + Z_{ij}\eta_1 + N_j\mu_1 + v_{ij} \dots\dots\dots(1)$$

Where D_{ij} = treatment variable for household i in community j
 X_{ij} = household characteristic, Z_{ij} = vector of instrumental variables, N_j = vector of community characteristics, v_{ij} = a non-systematic error term so that $E[v_{ij}|X_{ij}, Z_{ij}, N_j] = 0$.

$$Y_{ij} = X_{ij}\beta_2 + D_{ij}\theta + N_j\mu_2 + \varepsilon_{ij} \dots\dots\dots(2)$$

Where Y_{ij} = outcome variable (diarrhea) and X_{ij} and N_j are the same covariates as used in stage 1

Types of drinking water sources from which households collect their water for drinking purposes and the existence of **water user committee** (locally institutionalized group that often formed within a community when community water sources are constructed) are used as instrumental variable

Health effects of drinking water quality (diarrhea < 5 years old)

VARIABLES	(1) OLS	(2) Probit	(3) IV	(4) BP
Water quality (contaminated)	0.1495*** (0.0287)	0.1619*** (0.0330)	0.1547*** (0.0585)	0.1421** (0.0722)
Minutes to water source	0.0023* (0.0012)	0.0019** (0.0009)	0.0023* (0.0012)	0.0020** (0.0009)
Handwashing with soap	-0.0700** (0.0311)	-0.0705** (0.0323)	-0.0692** (0.0315)	-0.0725** (0.0340)
Safe stool disposal (neighbourhood mean)	-0.2157*** (0.0698)	-0.2322*** (0.0768)	-0.2155*** (0.0680)	-0.2313*** (0.0767)
Latrine density (neighbourhood mean)	0.1446** (0.0628)	0.1364** (0.0585)	0.1457** (0.0612)	0.1317** (0.0589)
Observation	562	562	562	562
Model F-test	12.93		256.65	
Model Chi2		203.98		669.96
Model P-value	0.0000	0.0000	0.0000	0.0000
Probit rho chi2				0.0852
Probit rho P-value				0.7704

Std. errors adjusted for 62 clusters in PSU and robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1
Probit and BP in Average marginal effects

Other control vars: child age & gender, mother & HH head age, HH density, number of adult woman, education, breastfeeding, livestock, HH size, income, dependency ratio & the number medical visits.

Conclusions

- Contaminated water quality increases diarrheal diseases prevalence by 15 percentage points.
- Household's stored drinking water quality is highly correlated with types of water sources.
- Availability of simple pit latrine increases the risk of diarrhea while safe disposal of child feces are protective against diarrheal diseases.

References

WHO/UNICEF. (2014). Progress on drinking water and sanitation: 2014 updates. New York, NY USA and Geneva, Switzerland.
 WHO/UNICEF. (2009). Diarrhoea: Why children are still dying and what can be done: World Health Organization (WHO) and United Nations Children's Fund (UNICEF).

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